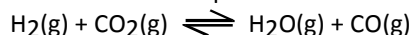


T17D05 – 17.1-2 IB Practice Problems

Name.....

1. Hydrogen and carbon dioxide react as shown in the equation below.



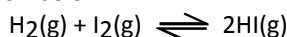
For this reaction the values of K_c with different temperatures are

Temperature / K	K_c
500	7.76×10^{-3}
700	1.23×10^{-1}
900	6.01×10^{-1}

Which statement for the reaction is correct?

- A. The forward reaction is endothermic.
 B. $\text{H}_2\text{O}(\text{g})$ and $\text{CO}(\text{g})$ are more stable than $\text{H}_2(\text{g})$ and $\text{CO}_2(\text{g})$.
 C. The reaction goes almost to completion at high temperatures.
 D. The reverse reaction is favoured by high temperatures.

2. For the reaction below



at a certain temperature, the equilibrium concentrations are (in mol dm^{-3})

$$[\text{H}_2] = 0.30, [\text{I}_2] = 0.30, [\text{HI}] = 3.0$$

What is the value of K ?

- A. 5.0
 B. 10
 C. 15
 D. 100
3. The equilibrium between nitrogen dioxide (dark brown) and dinitrogen tetroxide (colourless) is represented by the following equation.



- (a) Write the equilibrium constant expression, K_c .

.....

(1)

- (b) State and explain the effect of an increase in temperature on the value of K_c .

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(2)

- (c) State and explain the visible change that takes place as a result of a decrease in pressure, after equilibrium is re-established.

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(2)

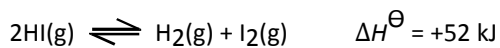
- (d) Two moles of $\text{NO}_2(\text{g})$ and two moles of $\text{N}_2\text{O}_4(\text{g})$ were placed in an empty 1 dm^3 container and allowed to come to equilibrium at 328 K. Predict, with reference to the value of K_c , whether the equilibrium mixture would contain more or less than two moles of $\text{NO}_2(\text{g})$.

.....

(2)

(Total 7 marks)

4. (a) The equation for the decomposition of hydrogen iodide is



Predict and explain the effect on the position of equilibrium of

- (i) increasing the pressure, at constant temperature. (2)
- (ii) increasing the temperature, at constant pressure. (2)
- (iii) adding a catalyst, at constant temperature and pressure. (2)
- (b) Deduce the expression for K_c for the forward reaction. (1)
- (c) The equilibrium formed during this reaction was investigated in two experiments carried out at different temperatures. The results are shown in the table below.

Experiment number	Initial concentration / mol dm ⁻³			Equilibrium concentration / mol dm ⁻³		
	[HI]	[H ₂]	[I ₂]	[HI]	[H ₂]	[I ₂]
1	0.06	0.00	0.00		0.01	
2	0.00	0.04	0.04	0.04		

- (i) For each experiment, deduce the concentrations of the other species present at equilibrium. Calculate the values of K_c for the forward reaction for each experiment. (6)
- (ii) Use the two calculated values of K_c to deduce which of the two experiments was carried out at the higher temperature, and explain your choice. (If you were not able to calculate the values of K_c in (c)(i), assume that the values are 0.1 for experiment 1 and 0.2 for experiment 2, although these are not the correct values.) (2)

(Total 15 marks)